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developer's guide

TM-U230

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Revision Information

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Rev. A		

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Key to Symbols

The following symbols are used in the documentation for this product. See the specific warnings and cautions at appropriate points throughout this guide.

⚠ WARNING:

Warnings must be followed carefully to avoid serious bodily injury.

⚠ CAUTION:

Cautions must be observed to avoid minor injury to yourself, damage to your equipment, or loss of data.

✎ ***Note:***
Notes have important information and useful tips on the operation of the product.

Safety Precautions

This section presents important information to ensure safe and effective use of this product. Please read this section carefully and store it in an accessible location.

⚠ WARNING:

- ❏ Turn off the power switch immediately and unplug the power cord from the electrical outlet if the TM-U230 produces smoke, a strange odor, or unusual noise. Continued use may lead to fire or electric shock.
- ❏ Do not modify the printer or perform any disassembly operation not described in this manual. Doing so could result in a fire or shock hazard.
- ❏ Use only the designated power supply. Use of a different power supply could cause a fire or shock hazard.
- ❏ Never insert or disconnect plugs with wet hands. Doing so may cause a serious shock.
- ❏ Never drop or push objects into the product through openings. This could cause a fire or shock.
- ❏ If the printer is exposed to water or other liquid, turn off the POWER button and disconnect the power cord immediately. Continued use under these conditions could cause a fire or shock hazard.
- ❏ Do not connect the power cord to an overloaded wall outlet. This may cause a fire hazard. Connect the printer directly to a wall outlet.
- ❏ Handle the power cord with care. Incorrect handling may lead to fire or shock.

- Do not modify the power cord.
- Do not place heavy objects on the power cord.
- Do not bend, twist, or pull the power cord excessively.
- Do not route the power cord near heaters.
- Remove any dirt or dust from the power plug before plugging it in.
- Be sure to fully insert the power plug.

⚠ CAUTION:

- ❑ All cables are to be connected only as described in the manual. Incorrect connection could cause damage or a fire hazard.
- ❑ Be sure to set this product on a firm, stable, horizontal surface. The product may break or cause injury if it falls.
- ❑ Do not install the printer in extremely humid or dusty locations. Operation under such conditions could damage the printer or cause a fire or shock hazard.
- ❑ Do not stand on the printer or place heavy objects on it. The printer could fall or collapse, causing breakage and possible injury.
- ❑ For added protection of the printer, disconnect the power plug from the wall outlet when the printer is not to be used for an extended period of time.
- ❑ Be sure not to touch the print head or motors when you remove paper jammed in the printer. Wait until the print head and motors have cooled down before removing jammed paper. When the printer has been used for an extended period, the print head and the motors are very hot and could cause burns.

Precautions in handling the fine coating of the case

A fine coating is used for the external surface of the plastic case of the printer, which makes wiping and removing kitchen stains easy; however, you should note the following when cleaning the surface in order to preserve the quality of the coating (the metal plate and the inside of the case do not have the fine coating):

- ❑ Do not scrub the surface with a hard object. Otherwise, the case will be scratched and harder to clean.
- ❑ Do not use a cleanser that includes polishing materials such as grains of glass, metal, or ceramics. Otherwise, the case will be scratched and harder to clean.
- ❑ Never use disinfectant, bleach, alcohol, benzine, thinner, chlorine solvent, or ketone solvent. Otherwise, the case will be harder to clean, and the case may be seriously harmed or even deformed and its color may be changed.
- ❑ The label may come off of the fine coating of the case if harsh cleaning methods are used.

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Moduler Connector

Use the moduler connector specifically designed for the cash drawer for this product. Do not connect a telephone line to the drawer kick-out connector.

About This Guide

This guide is intended to provide all information necessary for system planning, design, installation and application of the TM-U230 for designers and developers of POS systems.

Related Software and Documents

Software/document name	Description
TM-U230 User's Manual	Provides instructions for operators of POS systems in which the TM-U230 is installed so that the operators can use the TM-U230 safely and correctly.
TM-U230 Service Manual	Provides the information on printer maintenance and repair.
ESC/POS Application Programming Guide	Provides ESC/POS commands descriptions

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Chapter 1

Installation

Installation and Positioning of TM-U230

Precautions in Handling the Fine Coating Case

This printer is housed in a plastic case (*) with a fine coating; simple cleaning is enough to enable dirt to come off easily so that the exterior of the printer remains in good condition. Like plastic cases, handle the fine coating with care as described below.

(*)Fine coating is not applied to the installation surface of the metal plate, the power supply box and the inside of the case.

- Do not scratch the surface with hard objects; otherwise the case may become damaged and dirt may become difficult to remove.
- Do not use any type of abrasive agent (glass, metal, ceramic, etc.) to clean the case; otherwise the surface of the case may become damaged and dirt may become difficult to remove.
- Never clean the case with disinfectant, bleach, alcohol, benzene, thinner, chlorine, or ketone; otherwise the dirt may become difficult to remove. Also, they may cause the case to become discolored, dissolved, or deformed.
- Label may come off of the fine coating of the case.

Selecting a Place of Installation

This printer can be installed vertically (standard installation) so that the paper exit faces the front or horizontally so that the paper exit faces upwards. With the optional wall mounting bracket (Model No: WH-10) the printer can be wall-mounted.

Note:
Since vibrations are generated during paper cutting, take suitable measures to secure the printer.

❑ Installation on a table (vertical or horizontal installation)

- Regardless of installation method chosen, the tilt of surface selected must be 15° or less.
- Attach the supplied switch panel sheet for horizontal installation when the printer is to be installed horizontally.
- Adjust the N.E detector and attach the rubber feet as required by the chosen method of installation.

Environment Specifications

See the Environment Specifications section in Appendix A.

External Dimensions

See the External Appearance section in Appendix A.

Vertical installation

Horizontal installation

Desk installation

❑ Wall mounting

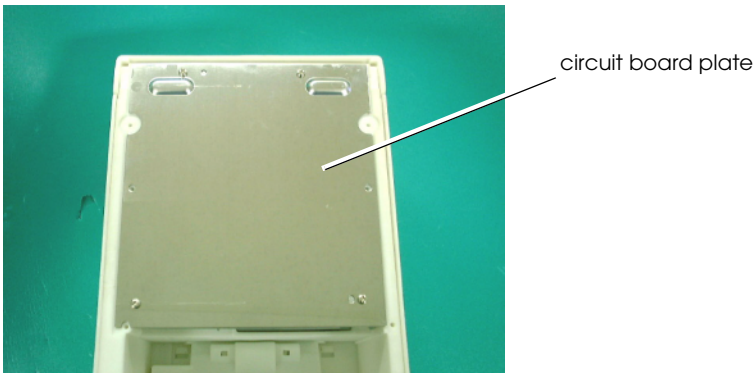
- Use the optional wall mounting bracket (Model Name: WH-10) when the printer is to be wall mounted.
- When the printer is wall mounted, adjust the N.E. detector in the same way as for vertical installation.
- The power supply box can be attached below the printer if necessary.

Wall-mounted installation

Dip Switch Settings

Make DIP switch settings according to the following procedures.

1. Remove the circuit board plate.



2. Set the DIP switches.

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Serial Interface

DIP Switch 1

Switch No.	Function	On	Off	Default
1	Data receive error	Ignored	Print "?"	Off
2	Receive buffer capacity	1KB	16KB	Off
3	Handshaking	XON/XOFF	DTR/DSR	Off
4	Word length	7 bit	8 bit	Off
5	Parity check	Yes	No	Off
6	Parity selection	Even	Odd	Off
7	Baud rate selection	4800 bps	9600 bps	Off
8	BUSY condition	Receive buffer-full	Offline Receive buffer-full	Off

DIP Switch 2

Switch No.	Function	On	Off	Default
1	Selects number of characters per line (cpl) (7×9 font/9×9 font)	42 cpl//35 cpl	40 cpl/33 cpl	Off
2	For internal use only (*1) (autocutter)	Enabled	Disabled	On
3	Pin 6 reset signal	Used	Not used	Off
4	Pin 25 reset signal	Used	Not used	Off
5	PAPER OUT LED blinking pattern	Blinks	Lights on	On
6	For internal use only (*1) (Flash memory rewriting)	Enabled	Disabled	off
7	For internal use only (*1) (Interface synchronization)	Asynchronous	Synchronous with clock	Off
8	internal buzzer	Disabled	Enabled	Off

*1: Do not change the settings of DIP switches 2-2, 2-6, and 2-7.

Parallel Interface

DIP Switch 1

Switch No.	Function	On	Off	Default
1	Auto line feed	Enabled	Disabled	Off
2	Receive buffer	1KB	16KB	Off
3 - 7	Undefined	--	--	Off
8	Busy condition	Receive buffer-full	Offline Receive buffer-full	Off

DIP Switch 2

Switch No.	Function	On	Off	Default
1	Selects number of characters per line (cpl) (7×9 font/9×9 font)	42 cpl//35 cpl	40 cpl/33 cpl	Off
2	For internal use only (*1) (autocutter)	Enabled	Disabled	On
3	Undefined	--	--	Off
4	Pin 31 reset signal	Used	Not used	On
5	PAPER OUT LED blinking pattern	Blinks	Lights on	On
6	For internal use only (*1) (Flash memory rewriting)	Enabled	Disabled	off
7	For internal use only (*1) (Interface synchronization)	Asynchronous	Synchronous with clock	Off
8	Undefined	--	--	Off

*1: Do not change the settings of DIP switches 2-2, 2-6, and 2-7.

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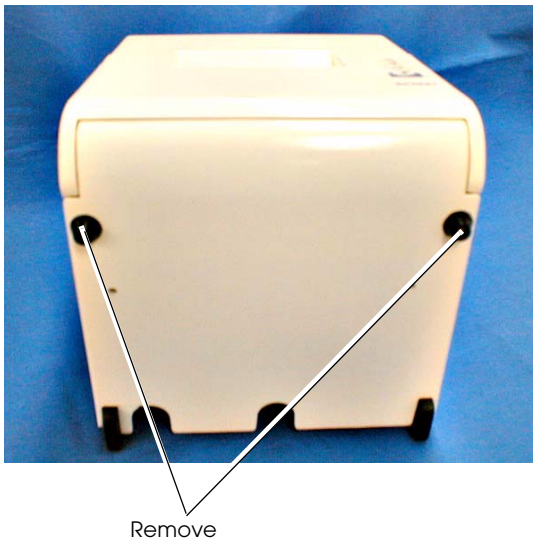
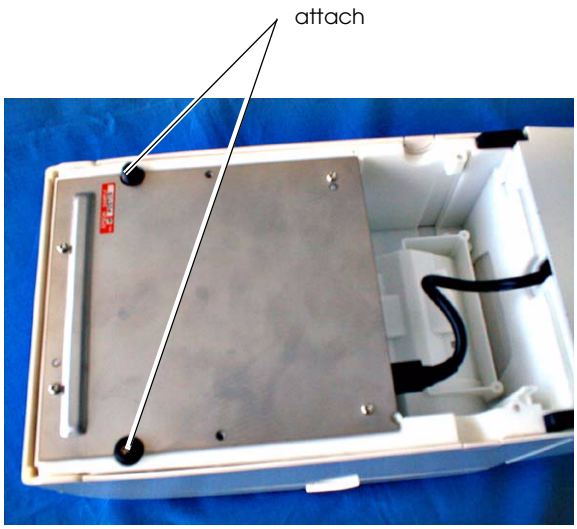
Settings for Horizontal Installation

Perform the following procedures when the printer is to be used in a horizontal installation.

Changing the Location of the Rubber Feet

Remove the rubber feet from the bottom of the printer and attach them to the back of the printer.

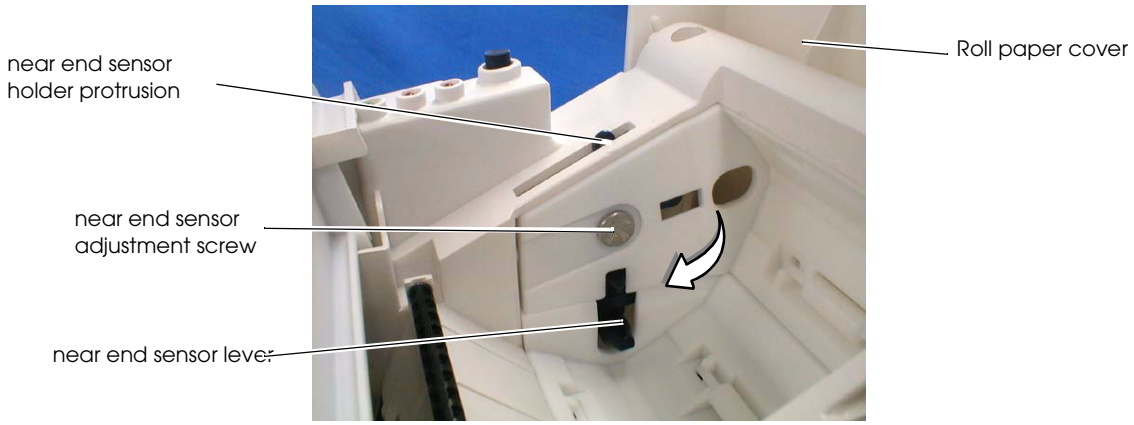




Changing the Orientation of Near End Sensor

Perform the following procedures to change the orientation of the near end sensor.

1. Place the printer horizontally and open the roll paper cover.
2. Use a coin to loosen the near end adjustment screw.
3. Turn the protrusion on the near end holder to change the position of the near end lever.
4. Tighten the near end adjustment screw, check that the near end sensor lever operates normally and close roll paper cover.



Changing the orientation of Near end sensor

Attaching Switch Panel for Horizontal Installation

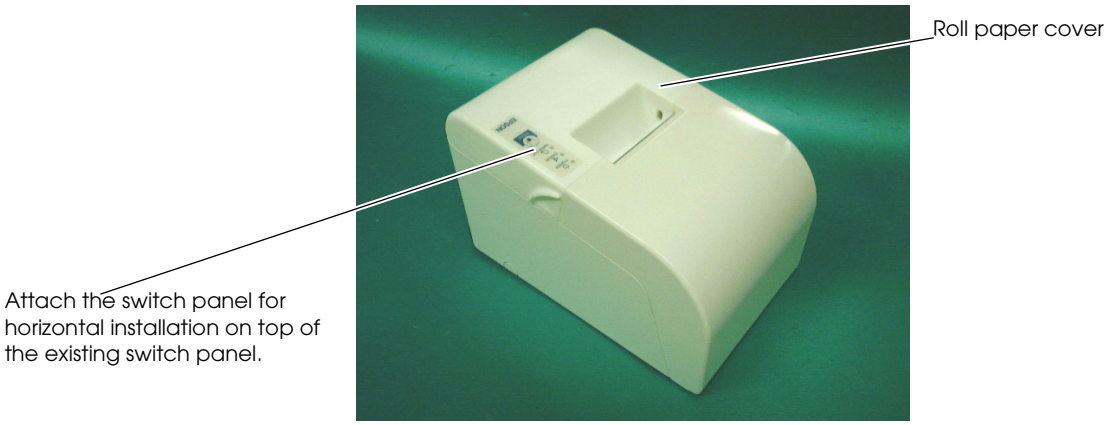
1. Clean the switch panel attached to roll paper cover.

   Note:
   Do not touch the switch panel surface after cleaning. Touching this surface may lower the strength of the adhesive.

2. Remove the seal covering the adhesive surface of the switch panel for horizontal installation.

   Note:
   Do not touch the adhesive surface of the switch panel for horizontal installation. Touching this surface may lower the strength of the adhesive.

3. Attach the switch panel for horizontal installation on top of the switch panel attached to the roll paper cover. Press down the switch panel with sufficient force equally across the surface of the panel.



Switch panel attachment

Attaching the Power Supply Box

The location of the power supply box varies with the method of installation.

⚠ *WARNING:*

Use only AC adapter designated by EPSON. Using a non-standard power supply may cause a fire or shock hazard.

When you are using an EPSON AC power supply or the equivalent, immediately turn off the printer and disconnect the power plug when you notice an abnormality.

⚠ *CAUTION:*

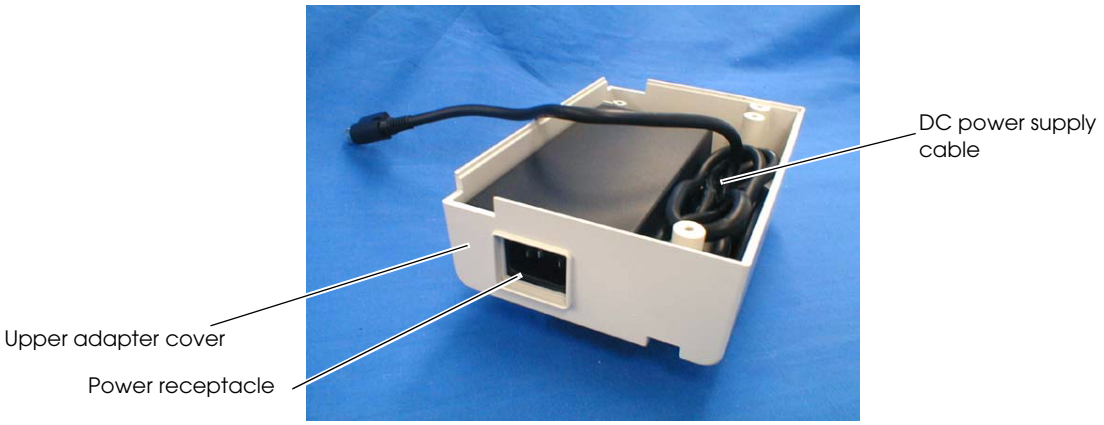
Always disconnect the power plug from the wall outlet when connecting or disconnecting the AC adapter. Otherwise you may damage the AC adapter or the printer.

Make sure that the rated voltage of the AC adapter matches the voltage of the wall outlet before connecting the AC adapter. Do not plug in the AC adapter if the voltages do not match. Otherwise you may damage the AC adapter or the printer.

Note:
To remove the DC cable connector, make sure the power supply power cord is unplugged; then grasp the connector at the arrow and pull it straight out.

Assembling the Power Box

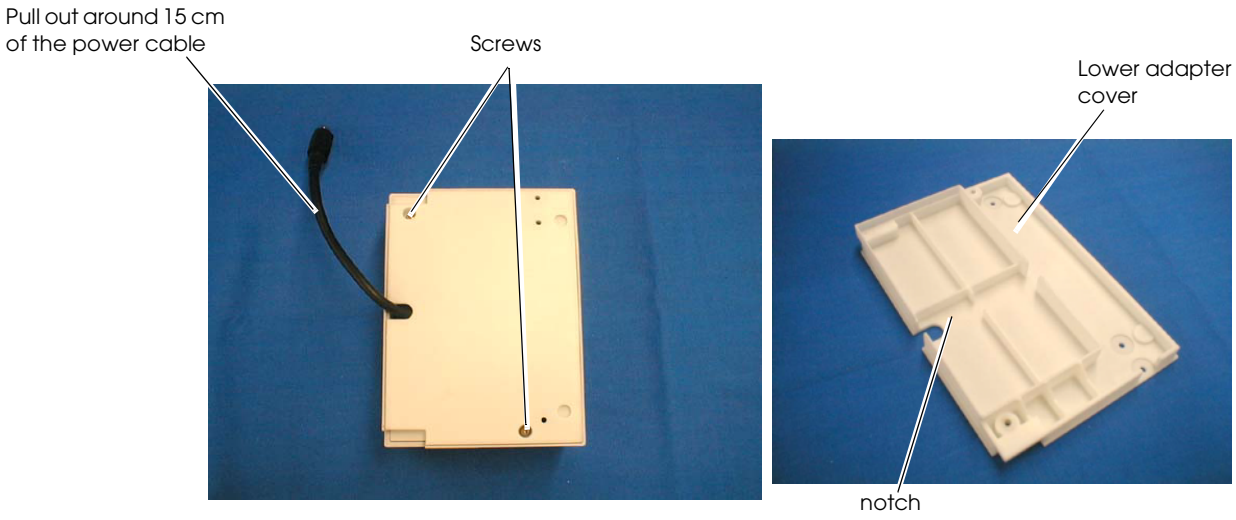
1. Place the AC adapter in the upper adapter cover. Bundle up the DC power supply cable. Be sure that the power receptacle is against the rectangular hole in the power supply box.



Power supply box assembly (1)

2. Put on the lower adapter cover with the cable through the notch in the lid and tighten the screws. In doing so, pull out the DC power supply cable from the DC power supply cable exit in the lower adapter cover so that around 15 cm of the cable protrudes from the cover.

3. Secure the covers with the screws packed with the printer (C.P.T-B Screw, 3 × 12, F/Zn).



Power supply box assembly (2)

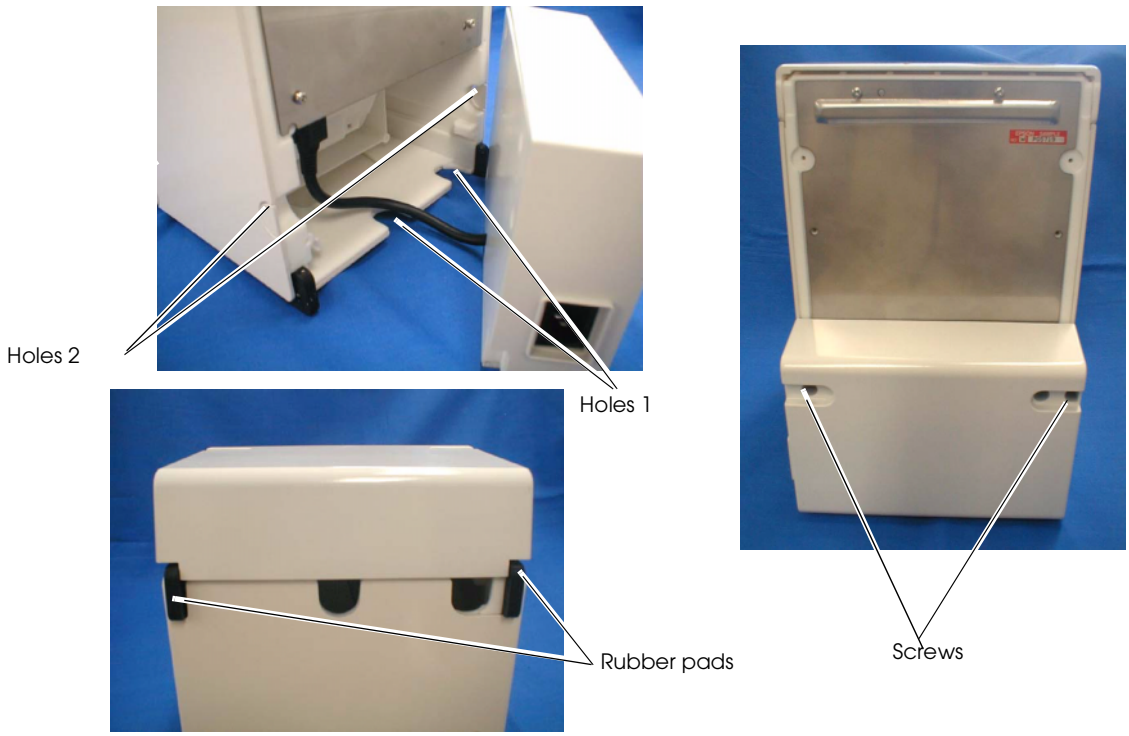
Vertical Installation

1. Check that the printer POWER switch is off and that the power supply cord of the AC adapter is not plugged into the wall outlet.

2. Connect DC power supply cable of the AC adapter to the DC connector on the printer.

   Note:
   Place the cables so that they go through the holes numbered 1 in the illlustration below. If there are many cables used, use the other holes numbered 2 (you need to break that parts).

3. Attach the power supply box to the rear of the printer, aligning the box inside the rubber pads and secure with two screws packed with the printer (C.P.T-B Screw, 3 × 14, F/Ni).

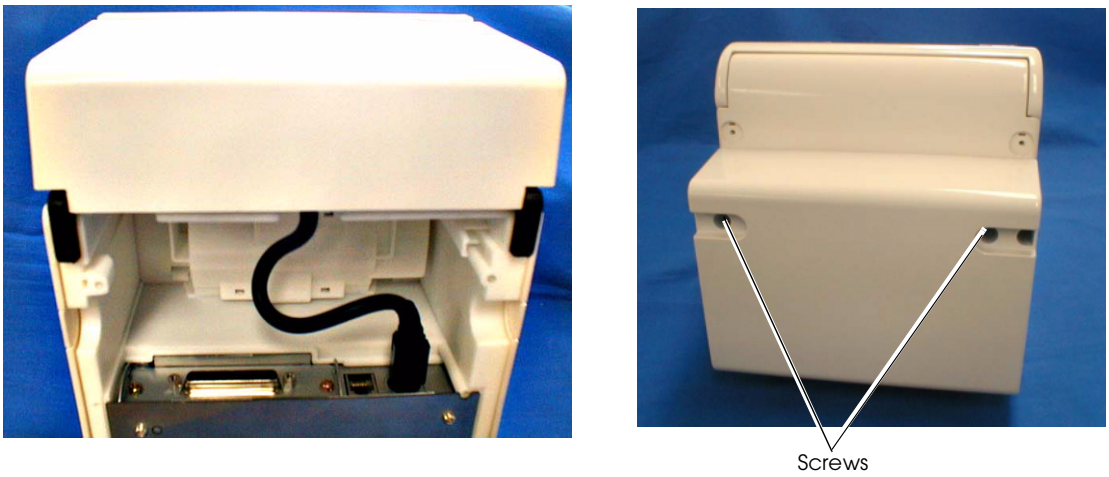


Horizontal Installation and Wall Mounting

1. Check that the printer POWER switch is off and that the power supply cord of the AC adapter is not plugged into the wall outlet.

2. Connect DC power supply cable of the AC adapter to the DC connector on the printer.

3. Attach the power supply box to the bottom of the printer and secure with two screws packed with the printer (C.P.T-B Screw, 3 × 14, F/Ni).



Attaching the power supply box for horizontal installation and wall mounting

Wall Mounting

An optional wall mounting bracket (Model Name: WH-10) is required to wall mount the printer.

Notes on Wall Mounting

- ❑ Cut printing paper may stick to the case due to static electricity (however, this does not affect printer operation).

Installation

⚠ CAUTION:

Before starting any installation work, turn off the printer and all accessories connected to the printer, and connect all cables connected to the printer.

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Installing the wall mount

⚠ CAUTION:

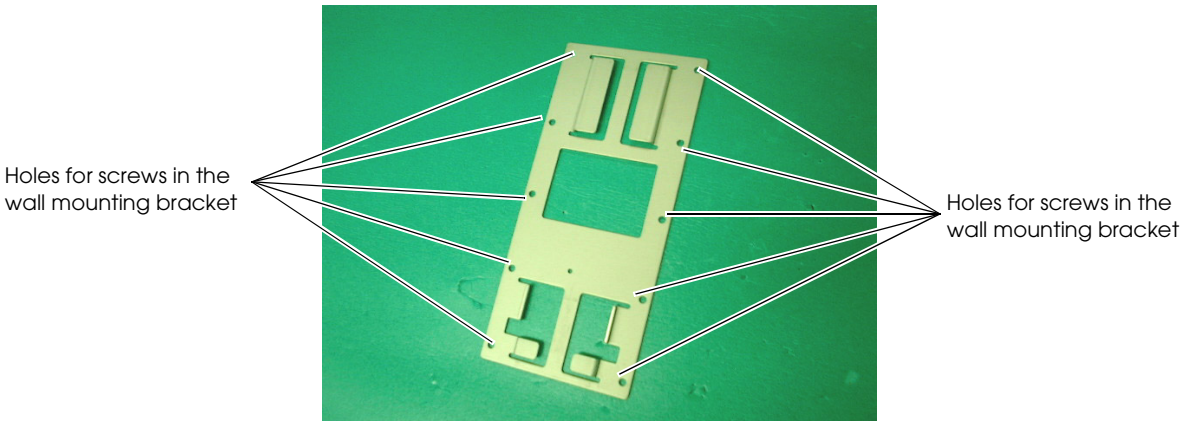
The weight of the printer is listed in Table 1-1. Use screws that are long enough to properly support the weight of the printer and that suit the type of wall you attach the mount to. It is recommended that you use screws with a 4 mm diameter.

Secure the mount to the wall using all the 10 screw holes.

Table 1-1 Weight of printer and accessories

	Weight
TM-U230 printer AC adapter Power supply box	Approx. 3.5 kg
TM-U230 printer	Approx. 2,8 kg

- ❑ Select a location for wall mounting that will provide sufficient space around the printer when the roll paper cover and cutter cover are open.
- ❑ Attach the wall mounting bracket using all the 10 screw holes.
- ❑ Since no screws have been supplied with the wall mounting bracket, select screws that suit the wall where the bracket is to be attached.



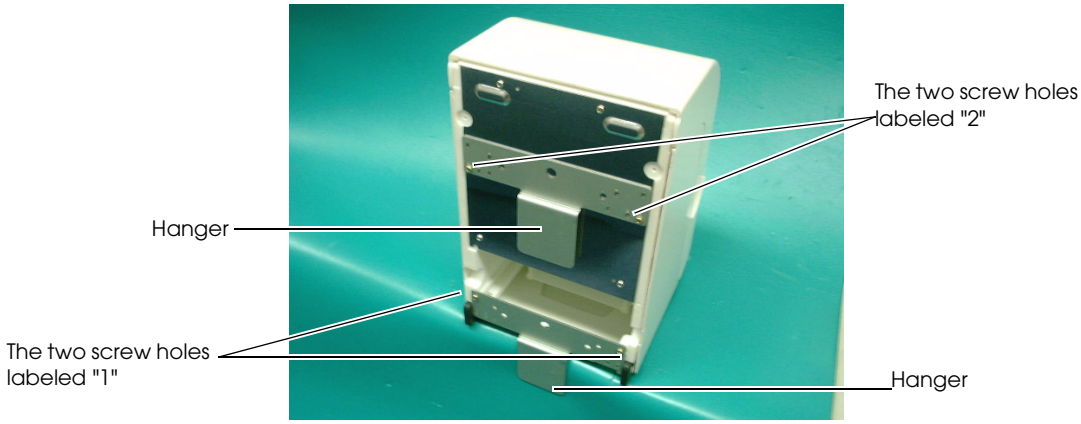
Screw holes in the wall mounting bracket

Attaching the hangers

Note:

- ❏ There are holes for 4 screws in the hangers (The number of the type of screw to be used is stamped on the hanger). Use the correct screw holes.
- ❏ In attaching the hangers to the printer, use the 4 screws supplied with the WH-10 wall mounting bracket.

1. Place the hangers on the printer (one at the center and the other at the bottom of the printer).
2. Use the screw holes in the printer marked "2" for the top hanger. Secure the hanger using two of the supplied screws.
3. Use the screw holes in the printer marked "1" for the bottom hanger. Secure the hanger using two of the supplied screws.



Attaching the hanger

⚠ *CAUTION:*

Make sure that all 4 screws are properly secured.

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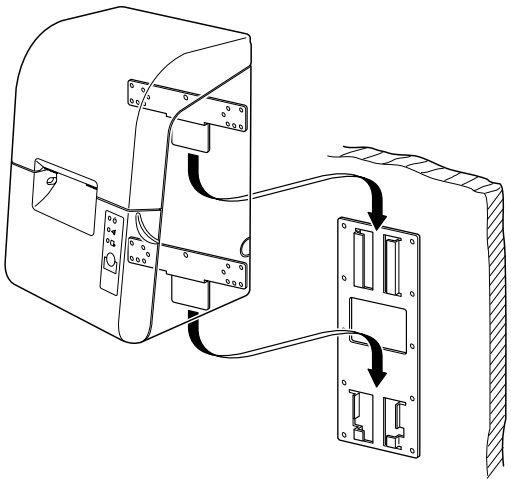
Attaching the printer to the wall

⚠ *CAUTION:*

Check again that the wall mounting bracket is properly secured to the wall before attaching the printer.

1. Insert the hangers in the groove of the wall mounting bracket.



Attaching the printer to a wall

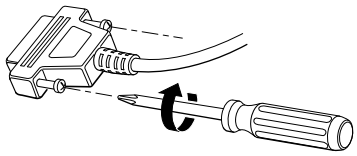
Connecting a Host PC

Turn off both the printer and the computer before making any cable connections.

Note:
Be sure that cables go through the holes numbered 1 in the illlustration on page 1-10. If there are many cables used, use the other holes numbered 2 (you need to break that parts).

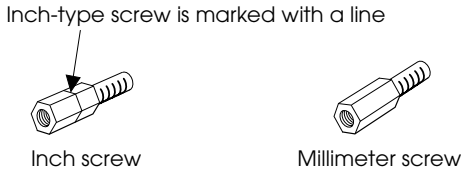
Serial interface connections

1. Connect the interface cable connector to the interface connector on the connector panel.
2. Secure both screws of connectors equipped with screws.



Tightening connector screws

Note:
Your printer has inch-type hexagonal lock screws installed. If your interface cable requires millimeter-type screws, replace the inch-type screws with the enclosed millimeter-type screws using a hex screwdriver (5 mm).



Inch screw and millimeter screw

3. If your interface connector has a grounding wire, attach it to the printer using the screw labeled FG.

4. Connect the other end of the interface cable to the host PC.

Connecting to a parallel interface

1. Connect the interface cable connector to the interface connector on the connector panel.

2. Close the tabs on both sides of the connector to lock it.

3. If your interface cable has a grounding wire, attach it to the printer using the screw labeled FG.

4. Connect the other end of the interface cable to the host PC.

Connecting to a USB interface

Be sure to use the same settings of the DIP switches as the parallel interface. Set DIP switch 2-4 (# 31 reset signal) On.

1. Attach a locking wire saddle as shown in the figure below.

2. Pass the USB cable through the locking wire saddle as shown in the figure.

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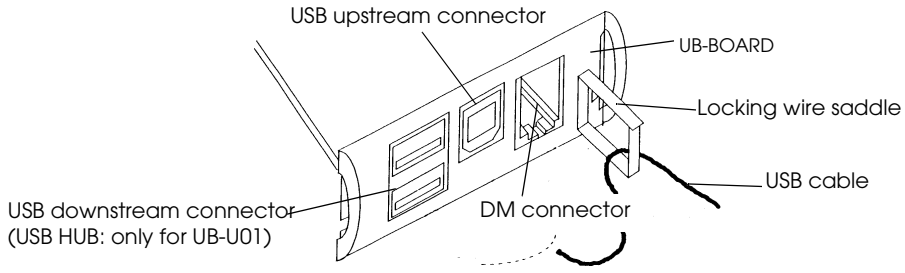
Note:
Passing the USB cable through the wire locking saddle as shown in the figure will keep the connection from coming loose.



Attaching the locking wire saddle

3. Connect the USB cable from the host PC to the USB upstream connector.

4. A total of 2 USB devices can be connected to the USB downstream connector to a printer equipped with UB-U01.

   Note:
   The UB-U01 hub is a power supply hub. Consequently, a bus power supply hub (including UB-U01) or a bus power supply function with a current consumption exceeding 100 mA cannot be directly connected to this connector. (A UB-U02 can be directly connected to a UB-U01 hub.)

5. Install a UB-U01/02 device driver on the host PC.

   Note:
   Please contact the dealer where you purchased the product for information on how to obtain device drivers and instructions on how to install them.

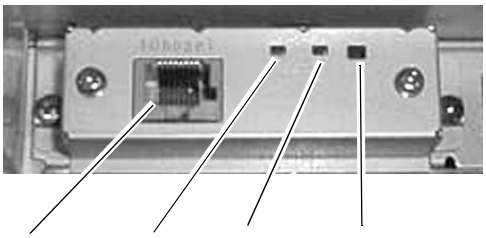
Connecting to an Ethernet interface

The UB-E01, designed for EPSON TM printers, is a 10 BASE-T Ethernet interfce board. The printer can be connected to a network through the UB-E01 directly. Be sure to note the following when using the UB-E01.

- ❑ Use the same settings of the DIP switches as the parallel interface.
- ❑ Before installing the UB-E01, be sure to enable the reset signal of the parallel interface by DIP switch setting.
- ❑ When turning on the power, the UB-E01 transmits the **GS I** and **GS a ffh** commands to acquire printer information.

Names of parts

Ethernet interface terms are given below.


10 BASE-T Ethernet interface connector
LED (green)
LED (red)
Switch
Do not press the LEDs.
Holding down this switch when the printer is powered up returns all settings to their default values.

Names of parts

Interface cable connections

⚠ CAUTION:

Connecting devices directly to LAN cables that are installed outdoors will expose them to damage from power surges caused by lightning and other inductive sources. It is best to make sure that devices without proper surge protection are cushioned by being connected through devices that do have surge protection. Otherwise, it is better not to connect them to outdoors lines.

1. Make sure that both the printer and the host PC are turned off.
2. Press in the 10 BASE-T cable plug into the 10 BASE-T Ethernet connector until you hear a clicking sound.

⚠ CAUTION:

Never connect a customer display connector cable, drawer kick-out connector or a public telephone line to the 10 BASE-T Ethernet connector.

Note:
Refer to the UB-E01 Developer's Guide for more details.

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Drawer Kick-Out Connector (Marked DK)

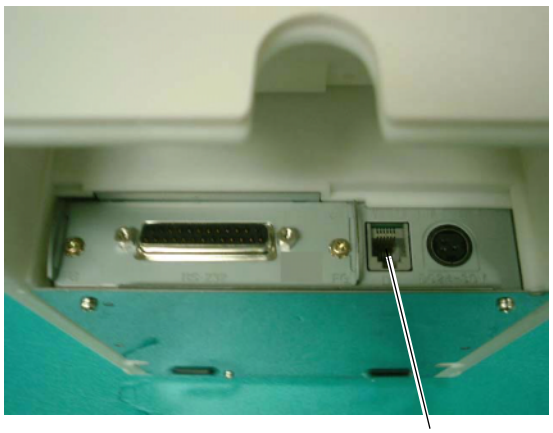
⚠ *CAUTION:*

Connect a drawer that matches the printer specifications. Using an improper drawer may damage the printer as well as the drawer.

Do not connect a telephone line to the drawer kick-out connector (marked DK). Such a connection may damage both the printer and the telephone lines.

Note:
Be sure that cables go through the holes numbered 1 in the illlustration on page 1-10. If there are many cables used, use the other holes numbered 2 (you need to break that parts).

1. Connect the drawer cable to the drawer kick-out connector (marked DK) on the connector panel.



Drawer connection

Chapter 2
Handling

Important Safety Information

⚠ WARNING:

- ❑ Turn off the power switch immediately and unplug the power cord from the electrical outlet if the TM-U230 produces smoke, a strange odor, or unusual noise. Continued use may lead to fire or electric shock.
- ❑ Do not modify the printer or perform any disassembly operation not described in this manual. Doing so could result in a fire or shock hazard.
- ❑ Use only the designated power supply. Use of a different power supply could cause a fire or shock hazard.
- ❑ Never insert or disconnect plugs with wet hands. Doing so may cause a serious shock.
- ❑ Never drop or push objects into the product through openings. This could cause a fire or shock.
- ❑ If the printer is exposed to water or other liquid, turn off the POWER button and disconnect the power cord immediately. Continued use under these conditions could cause a fire or shock hazard.
- ❑ Do not connect the power cord to an overloaded wall outlet. This may cause a fire hazard. Connect the printer directly to a wall outlet.
- ❑ Handle the power cord with care. Incorrect handling may lead to fire or shock.
  - Do not modify the power cord.
  - Do not place heavy objects on the power cord.
  - Do not bend, twist, or pull the power cord excessively.
  - Do not route the power cord near heaters.
  - Remove any dirt or dust from the power plug before plugging it in.
  - Be sure to fully insert the power plug.

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⚠ CAUTION:

- ❑ All cables are to be connected only as described in the manual. Incorrect connection could cause damage or a fire hazard.
- ❑ Be sure to set this product on a firm, stable, horizontal surface. The product may break or cause injury if it falls.
- ❑ Do not install the printer in extremely humid or dusty locations. Operation under such conditions could damage the printer or cause a fire or shock hazard.
- ❑ Do not stand on the printer or place heavy objects on it. The printer could fall or collapse, causing breakage and possible injury.
- ❑ For added protection of the printer, disconnect the power plug from the wall outlet when the printer is not to be used for an extended period of time.
- ❑ Be sure not to touch the print head or motors when you remove paper jammed in the printer. Wait until the print head and motors have cooled down before removing jammed paper. When the printer has been used for an extended period, the print head and the motors are very hot and could cause burns.

Precautions in handling the fine coating of the case

A fine coating is used for the external surface of the plastic case of the printer, which makes wiping and removing kitchen stains easy; however, you should note the following when cleaning the surface in order to preserve the quality of the coating (the metal plate and the inside of the case do not have the fine coating):

- ❑ Do not scrub the surface with a hard object. Otherwise, the case will be scratched and harder to clean.
- ❑ Do not use a cleanser that includes polishing materials such as grains of glass, metal, or ceramics. Otherwise, the case will be scratched and harder to clean.
- ❑ Never use disinfectant, bleach, alcohol, benzine, thinner, chlorine solvent, or ketone solvent. Otherwise, the case will be harder to clean, and the case may be seriously harmed or even deformed and its color may be changed.
- ❑ The label may come off of the fine coating of the case if harsh cleaning methods are used.

Waterproof

The TM-U230 is designed as a kitchen printer with protection from water. When it is installed vertically, the printer meets the European Standards IEC 529 for protection against water, evaluating IP level. (The TM-U230 also meets the IEC Standards for protection from tools and thin wires with a diameter more than 2.5 mm and protection from solid foreign objects with a diameter greater than 2.5 mm.) The IP code of the TM-U230 when it is installed vertically is IP31. The meaning of the "IP" numbers is described in the next section of this manual.

IP

The ability of an enclosure to keep out dirt and water is defined in IEC 529. When an enclosure protects the equipment from water and particles of dirt, it also protects people from any potential hazard inside the equipment.

The degree of protection is designated by the letters "IP" followed by two digits such as "IP01" or "IP34." The first digit indicates the degree that the equipment is protected from solid foreign objects. The second digit indicates the degree that the equipment is protected from water. The details are described in the tables below. The first digit, protection from solid foreign objects, is divided into "protection from human contact" and "protection from foreign bodies."

First Digit	Protection From Human Contact	Protection From Foreign Bodies
0	No protection	No protection
1	Protection from the palm of a hand	Protection from foreign bodies with a diameter greater than 50 mm
2	Protection from fingers	Protection from foreign bodies with a diameter greater than 12.5 mm
3	Protection from tools and thin wires, etc. with a diameter more than 2.5 mm	Protection from foreign bodies with a diameter greater than 2.5 mm
4	Protection from tools and thin wires, etc. with a diameter more than 1 mm	Foreign body with a diameter greater than 1 mm
5	Complete protection	Protection from grainy foreign bodies (only a certain amount is permitted)
6	Complete protection	Complete protection from grainy foreign bodies

Second Digit	Ability to keep water out
0	No protection
1	Keeps out water coming from directly above
2	Keeps out water coming from an angle up to 15° from vertical
3	Keeps out water sprayed at an angle of 60° from vertical
4	Keeps out water sprayed from all directions (only a certain amount of water penetrating the enclosure is permitted)
5	Keeps out low pressure water jet sprayed from all directions (only a certain amount of water penetrating the enclosure is permitted)
6	Keeps out high pressure water jet sprayed from all directions (only a certain amount of water penetrating the enclosure is permitted)
7	Keeps out water during temporary immersion
8	Keeps out water during permanent immersion

Example:
When the IP code of a product is IP01, the first digit means that the product has no protection from human contact or foreign bodies. The second digit means that the product is protected from water coming from directly above.

The test for keeping out water coming from directly above is executed under the following conditions.

Test equipment	Amount of water	Time
Put on a revolving plate	$1 +^{0.5}_{0}$ mm/min.	10 min.

Waterproof mechanism

TM-U230 is especially designed to protect the printer from water. If the printer is installed horizontally, when water enters the printer through the portions indicated in blue, that water goes out of the printer through the portions indicated in red.

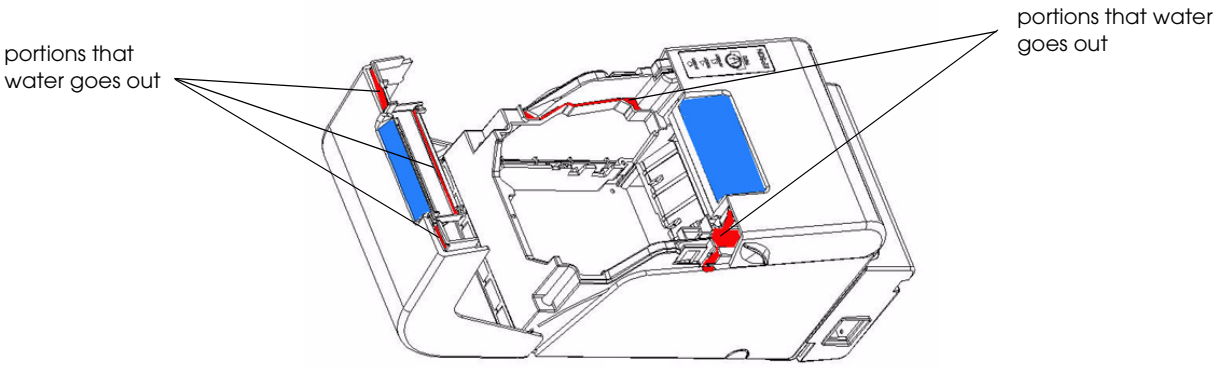

Figure 2-1

Replacing roll paper

Use the designated type of roll paper. (See Appendix A for information on roll paper specifications.)

1. Be sure that the power is turned on.
2. Open the roll paper cover.
3. Remove the roll paper and cut the paper along the dotted line in the figure below.

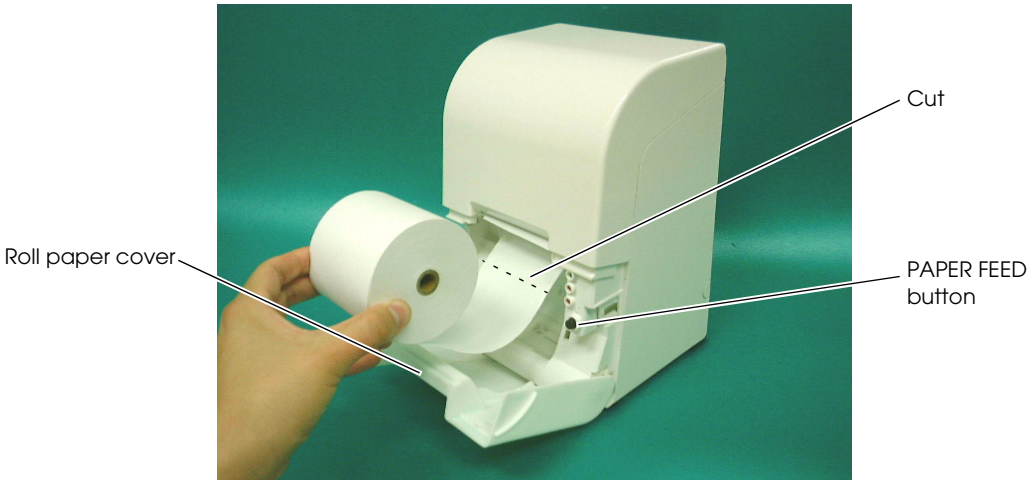

Figure 2-2 Cutting roll paper

4. Press the PAPER FEED button to remove the cut paper.
5. Use a pair of scissors to cut the front end of the paper off squarely.

Figure 2-3 Shape of roll paper front end

6. Load the roll paper in the printer. Be sure to note the correct direction that the paper should come off the roll. (See Figure 2-4.)
7. Hold the front end of the roll paper with both hands and insert the roll paper into the paper insertion slot as far as it will go. The roll paper is now automatically fed.

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Note:
If the cutter cover is opened, the printer is offline and paper will not be fed automatically. Be sure to close the cutter cover.

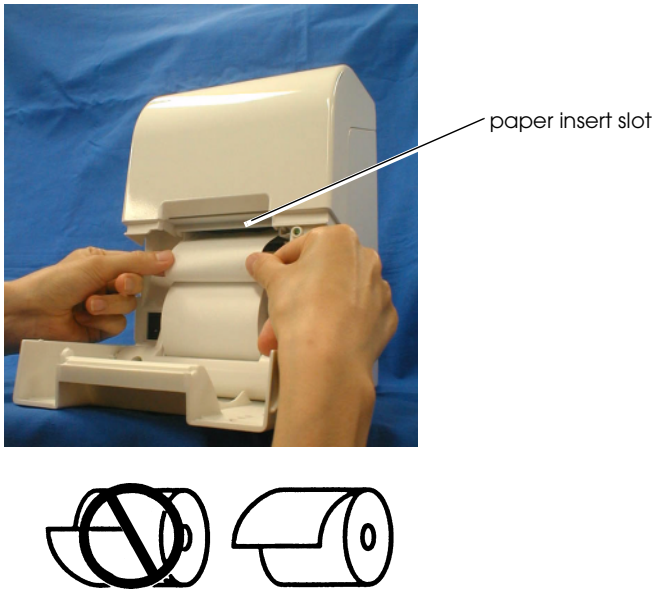

Figure 2-4 Loading roll paper

8. Close the roll paper cover.
9. When the PAPER OUT LED starts to flash, press the PAPER FEED button. The printer is online when the PAPER OUT LED stops flashing.

Note:
The printer is offline as long as the LED is flashing.

Replacing the ribbon cassette

Use the EPSON ERC-38 ribbon cassette.

1. Open the roll paper cover.
2. Open the cutter cover.
3. Raise the autocutter lock lever and open the autocutter. Be sure that the autocutter is locked.

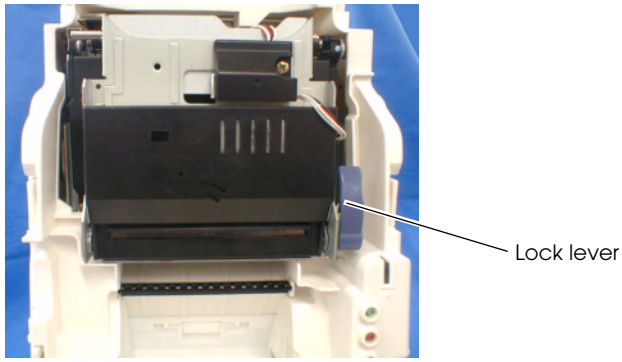

Figure 2-5 Autocutter lock lever

4. Take the ribbon cassette out of the printer.
5. Turn the knob on the new ribbon cassette in the direction indicted by the arrow on the cassette to remove any slack.

⚠ CAUTION:

Do not turn the ribbon cassette knob in the opposite direction. Turning the knob in the opposite direction may damage the ribbon cassette.

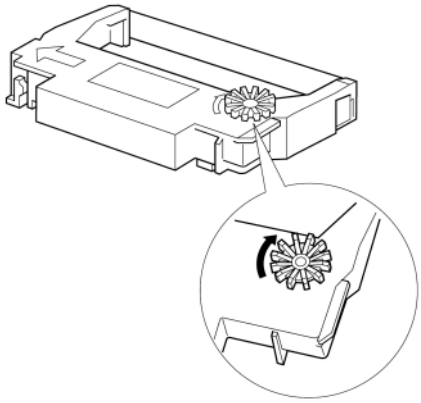

Figure 2-6 Removing ribbon slack

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6. Insert the ribbon between the print head and the platen, as shown in the figure below, and press it in until it clicks into place.

7. Turn the ribbon cassette knob 5 to 6 times in the direction of the arrow to remove any slack in the ribbon.

Note:
Make sure that the ribbon is inserted between the print head and the platen and that there are no creases or folds in the ribbon.

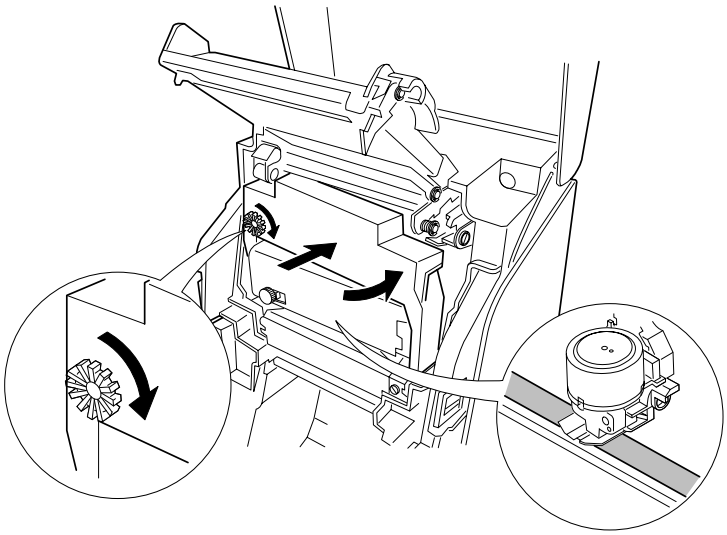

Figure 2-7 Installing the ribbon cassette and removing ribbon slack

Removing paper jams

Paper jams in the vicinity of the print head

1. Turn off the power and open the roll paper cover.
2. Take out the roll paper and cut the paper along the dotted line in the figure below.

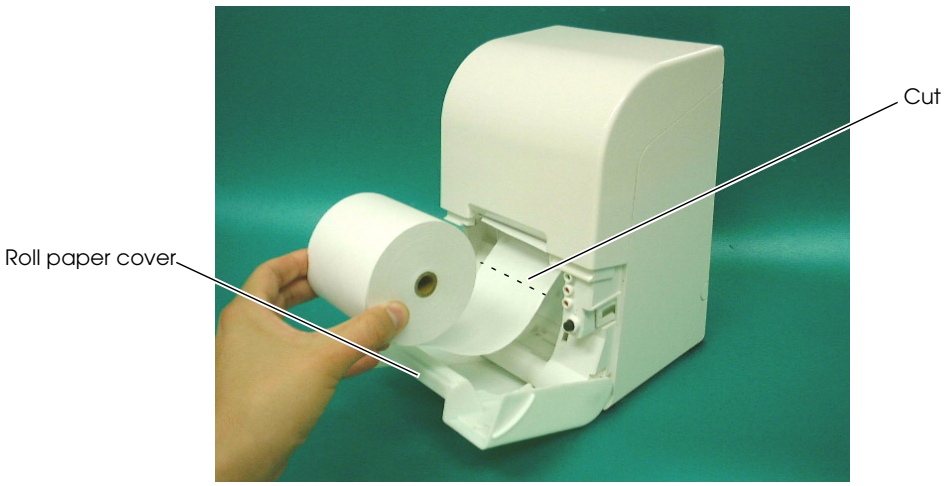

Figure 2-8 Cutting roll paper

3. Open the cutter cover.
4. Raise the autocutter lock lever and open the autocutter.
5. If possible, pull the jammed paper in the paper exit direction to remove it. If the paper cannot be pulled out in the direction of the paper exit, try the following procedure.

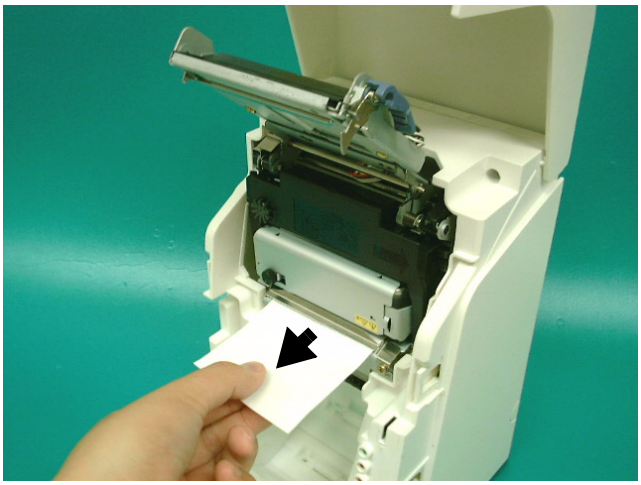

Figure 2-9 Removing jammed paper

⚠ CAUTION:

Do not remove jammed paper by pulling it against paper feed direction.

6. Take the ribbon cassette out of the printer.
7. Loosen the screw that secures the print head cover. Loosen the screw until it tilts.
8. Remove the print head cover.

⚠ CAUTION:

The print head becomes hot during printing. Perform this procedure when the print head has become cool.

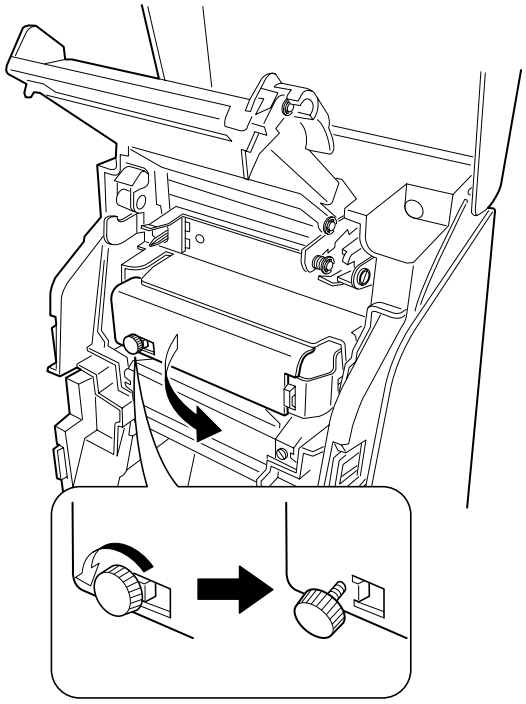

Figure 2-10 Removing the print head cover

9. Remove the jammed paper.

> ⚠ ***CAUTION:***
> *Do not remove jammed paper by pulling it against paper feed direction.*

10. Perform Steps 7 and 8 above in the opposite order to install the print head cover and secure it with the screw.

> ⚠ ***CAUTION:***
> *Be sure to properly secure the cover with the screw.*

11. Install the ribbon cassette in the printer.

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Paper jam in the auto cutter

When the autocutter blade is visible through the slit, a paper jam may have occurred in the auto cutter. Insert a screwdriver in the hole on the side of the autocutter to turn the gear and return the blade to a position where it cannot be seen from the slit (indicated by the bold dotted line in Figure 2-10).

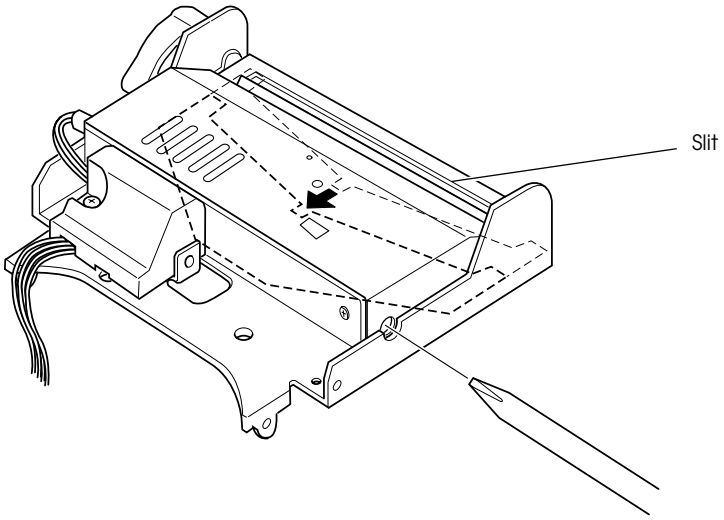

Figure 2-11 Normal auto cutter position

Installing the power button cover

The power button cover is provided to prevent someone from pressing the power button inadvertently. Install the cover over the printer POWER button as shown in the figure below.

When a power button cover has been installed, insert a ballpoint pen or the like in the holes provided to turn the printer on and off.

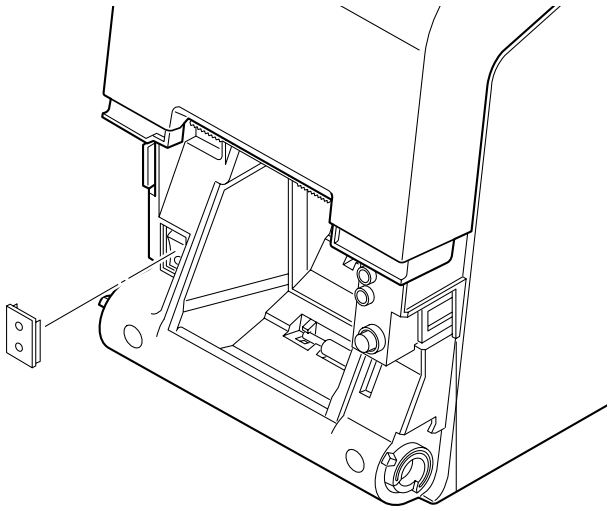

Figure 2-12 Installing the power button cover

⚠ *WARNING:*

Should an emergency arise when the power button is installed, immediately disconnect the AC cable of the AC adapter from the power outlet. Continued use under these conditions could result in fire or shock hazard.

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Chapter 3
Compatibility

This Chapter describes features that are different between the TM-U230 and TM-U210 Series printers.

Internal Buzzer

The TM-U230 can have the internal buzzer enabled (DIP Switch 2-8 Off) or the internal buzzer disabled (DIP Switch 2-8 On) using the setting of DIP switch 2-8. The default is Off.

When the internal buzzer is enabled and a paper roll end or near-end is detected, the buzzer will sound and the PAPER OUT LED will be on or blinking. (The pattern of the PAPER OUT LED can be selected by DIP switch 2-5.)

Paper roll end settings

- When the paper roll end sensor is disabled to stop printing, the PAPER OUT LED will be on (or blinking) but the printer will not be offline.
- When the paper roll end sensor is enabled to stop printing, both the PAPER OUT LED and the ERROR LED will be on (or blinking) and the printer will be offline.

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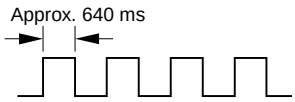
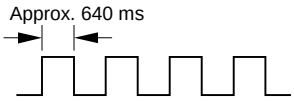
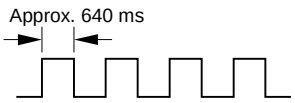
Condition	DIP Switch 2-5 (PAPER OUT LED)	DIP Switch 2-8 (Internal buzzer)	Blinking pattern of PAPER OUT LED and buzzer pattern
Paper end	Off (LED is On)	Off (Enabled)	LED is On
			Buzzer sounds continuously
		On (Disabled)	LED is On
			No buzzer sound
	On (Blinking)	Off (Enabled)	LED blinking pattern 
			Buzzer sound pattern 
		On (Disabled)	LED blinking pattern 
			No buzzer sound

Figure 3-1 PAPER OUT LED and internal buzzer operation

Replacing the paper roll or pressing the FEED button stops the buzzer sound and turns off the PAPER OUT LED. When you turn off the PAPER OUT LED by pressing the FEED button, be sure to consider the following.

- ❑ When the paper roll end sensor is disabled to stop printing and it detects a paper end, only the POWER LED is on, which is the same as for the usual online status.
- ❑ When the paper roll end sensor is enabled to stop printing and it detects a paper end, both the POWER LED and ERROR LED are on, which is the same as the usual offline status.

For details of the status of the LEDs when a paper end is detected, see the following table:

Stop printing disabled/ enabled	**Sensor**	**Status of panel LEDs and printer**		
		Normal	Paper end detected (the first time)	After pressing the FEED button
Disabled	Paper roll near-end sensor (**ESC c 4 0**)	POWER LED: On ERROR LED: Off PAPER OUT LED: Off Printer status: Online	POWER LED: On ERROR LED: Off PAPER OUT LED: On (blinking) Printer status: Online	POWER LED: On ERROR LED: Off PAPER OUT LED: Off Printer status: Online
Enabled	Paper roll near-end sensor (**ESC c 4 1**)	POWER LED: On ERROR LED: Off PAPER OUT LED: Off Printer status: Online	POWER LED: On ERROR LED: On PAPER OUT LED: On (blinking) Printer status: Offline	POWER LED: On ERROR LED: On PAPER OUT LED: Off Printer status: Offline
	Paper roll end sensor			

The printer status can be checked by commands such as **GS a**.

See Appendix B for more details.

Receive Buffer

The selectable receive buffer size differs depending on the setting of DIP switch 1-2.

Printer	**DIP switch**	**On**	**Off**	**Default**
TM-U230	1-2	1K bytes	16K bytes	Off
TM-U210 series	1-2	40 bytes	ANK: 1K bytes Multilingual: 512 bytes	Off

For the TM-U210 series printers, when DIP switch 1-2 is off, the following commands cannot be used; however the TM-U230 can use them.

Printer	**Name**
HT	Horizontal tab
ESC %	Select/cancel user-defined character set
ESC &	Define user-defined characters
ESC ?	Cancel user-defined characters

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Printer	Name
ESC D	Set horizontal tab positions
FS 2	Define user-defined Kanji characters (only for Multilingual specification)
FS ?	Cancel user-defined Kanji characters (only for Multilingual specification)

Receive buffer full conditions are different.

Printer	Receive buffer-full conditions
TM-U230	When the remaining memory size becomes 128 bytes, the printer will be BUSY and when it returns to 256 bytes, the BUSY condition will be canceled.
TM-U210 series	When the remaining memory size becomes 16 bytes, the printer will be BUSY and when it returns to 26 bytes, the BUSY condition will be canceled.

Mounted Mechanism

Printer	Mounted Mechanism
TM-U230	Autocutter and near-end sensor are standard equipment Has no paper roll take-up device
TM-U210 series	Near-end sensor is an option Available with or without an autocutter Available with or without a paper roll take-up device

Page 254, 255 (Space Page)

There is difference in a memory mapping.

Printer	Memory Mapping		
TM-U230	Page 254	7 × 9 font	First address ECBA0
		9 × 9 font	First address ED5A0
	Page 255	7 × 9 font	First address EE1A0
		9 × 9 font	First address EEBA0
TM-U210 series	Page 254	7 × 9 font	First address 8CBA0
		9 × 9 font	First address 8D5A0
	Page 255	7 × 9 font	First address 8E1A0
		9 × 9 font	First address 8EBA0

Chapter 4

Programming Samples

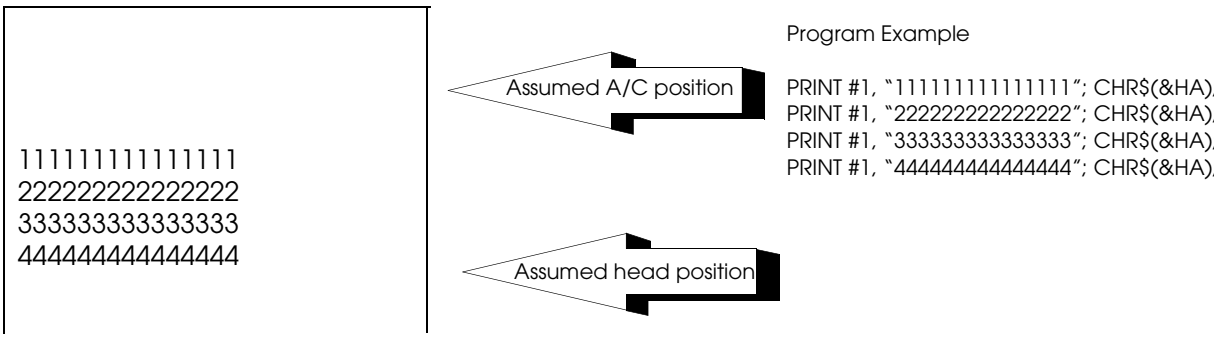
Saving Space for Receipt Printing

TM-U230 has **GS V function C**, which can save space for receipt printing. The details of this function are described below, comparing **GS V function C with GS V function B**.

- **GS V function C** Executes a partial cut (one point left uncut)
- **GS V function B** Feeds paper for cutting position + [$n \times 0.176$ mm {1/144"}] and executes a partial cut (one point left uncut)

GS V (Function B)

1. The application will start printing Receipt 1. (There is space at the top when executing **GS V function B**.)



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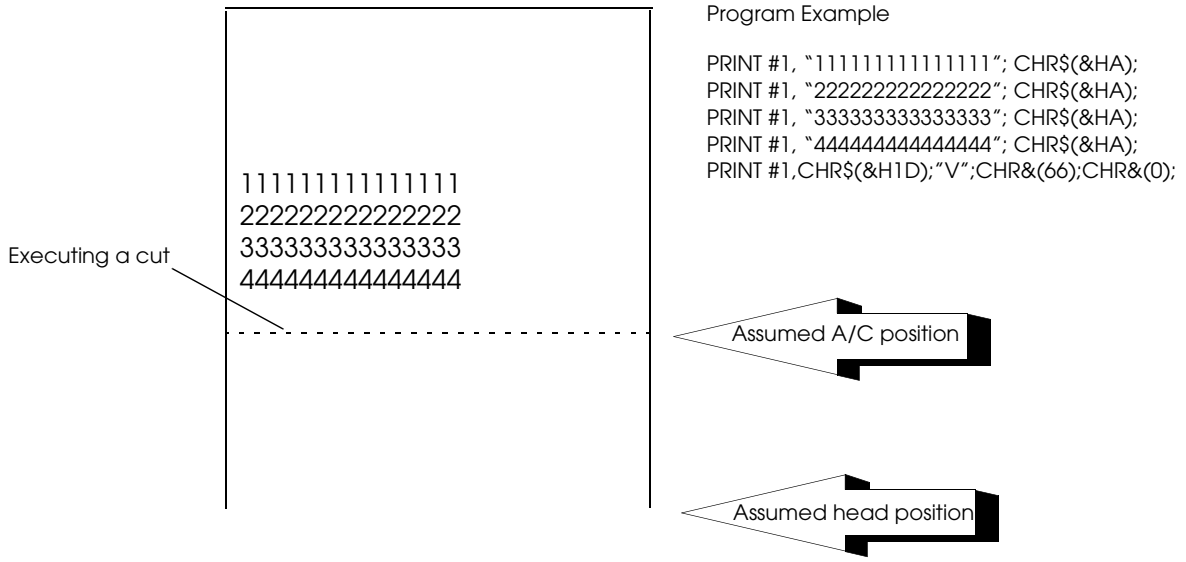
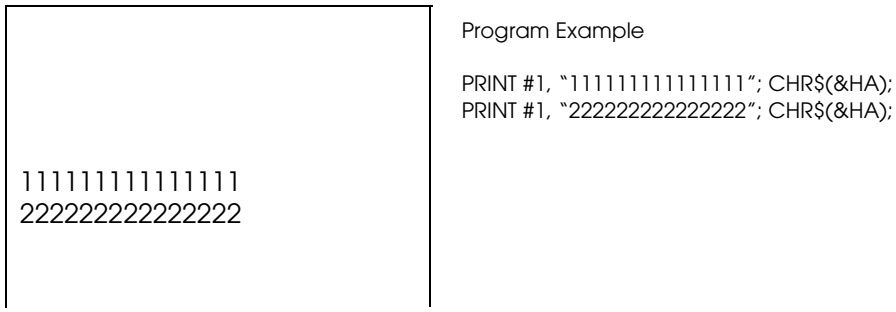
2. After printing Receipt 1, the application executes **GS V function B**. The printer feeds paper so that the printing on Receipt 1 exceeds the autocutter position and cuts the paper. For the next printing, there will be space between the positions of the autocutter and the print head.

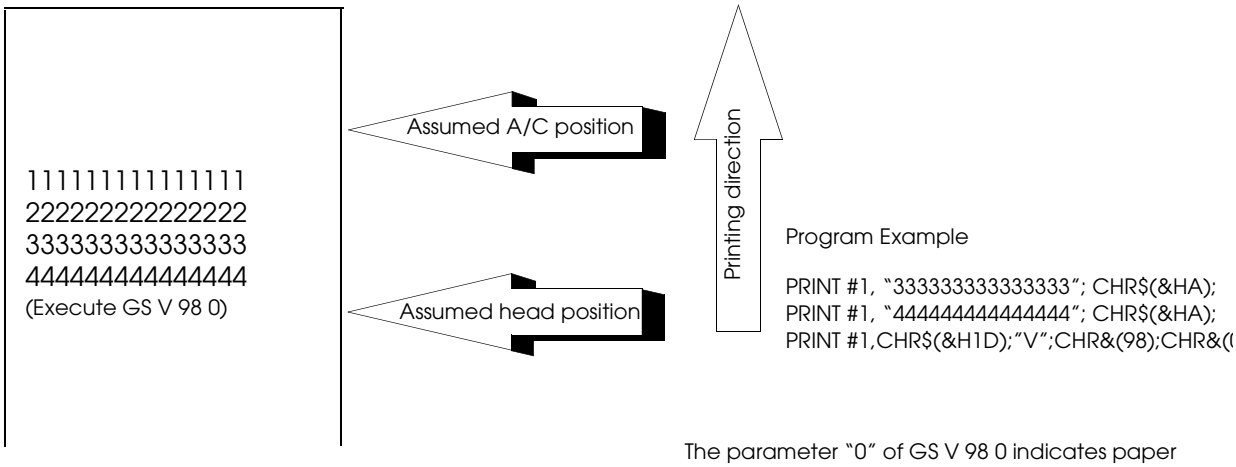


GS V (Function C)

1. The application will start printing Receipt 1. (There is space at the top when executing **GS V function B**.)



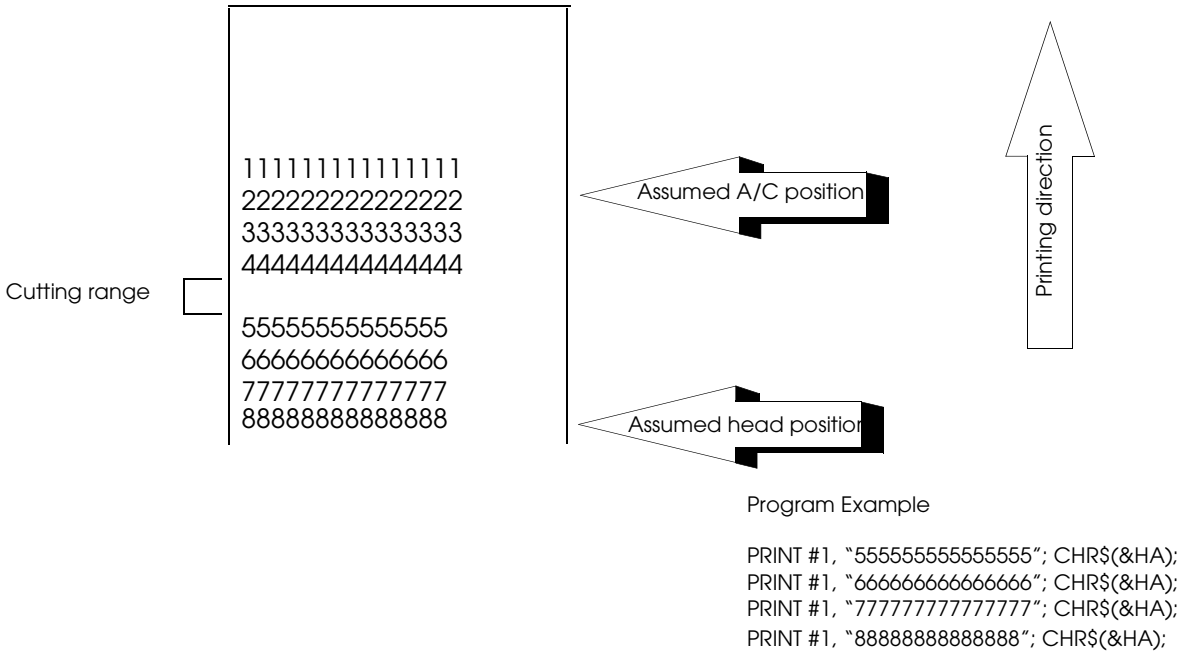
2. After printing the last line of Receipt 1, the application executes **GS V function C**.



The parameter "0" of GS V 98 0 indicates paper feed amount executed right before the paper cut.

When the printer processes **GS V function C**, feeds paper for 4 mm to secure space for the cutting range.

3. The application starts printing Receipt 2.



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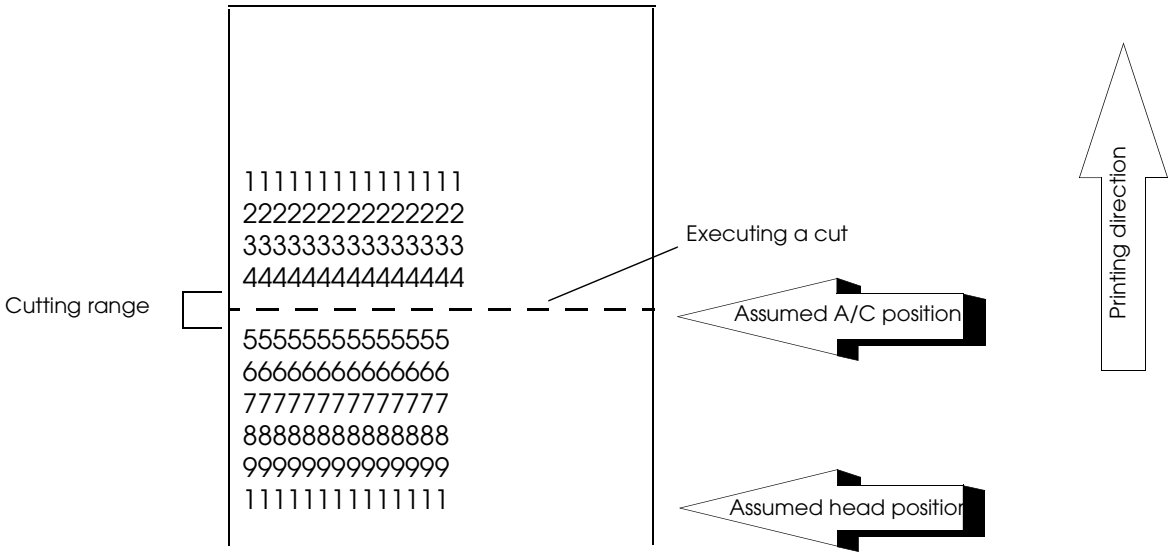
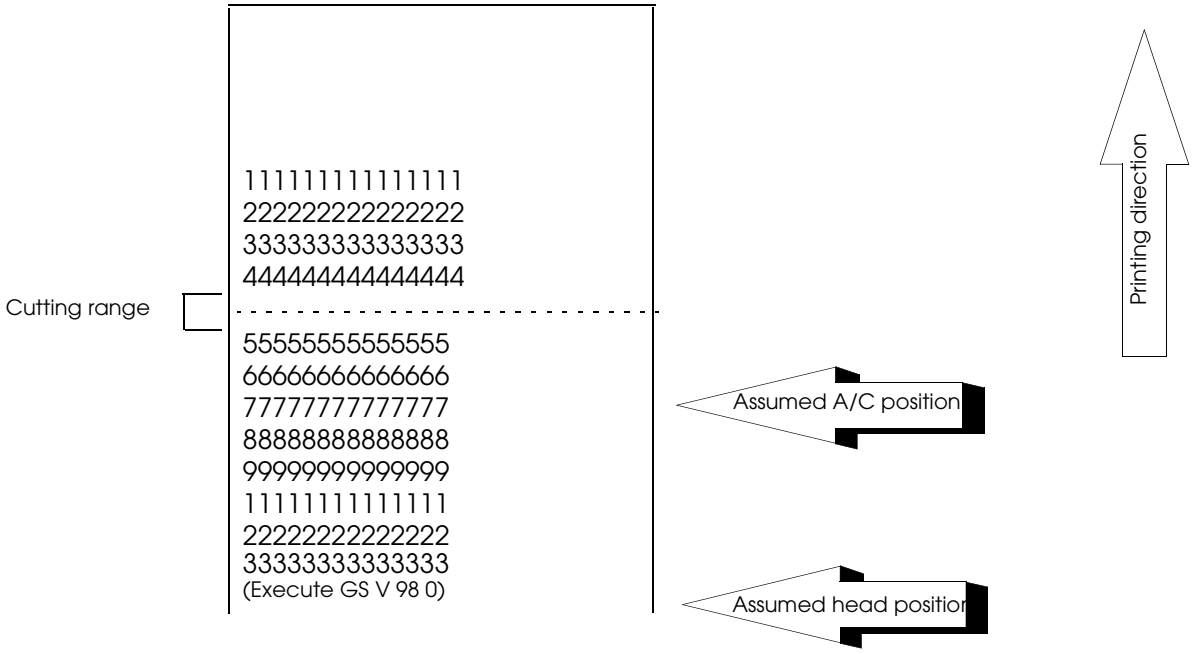
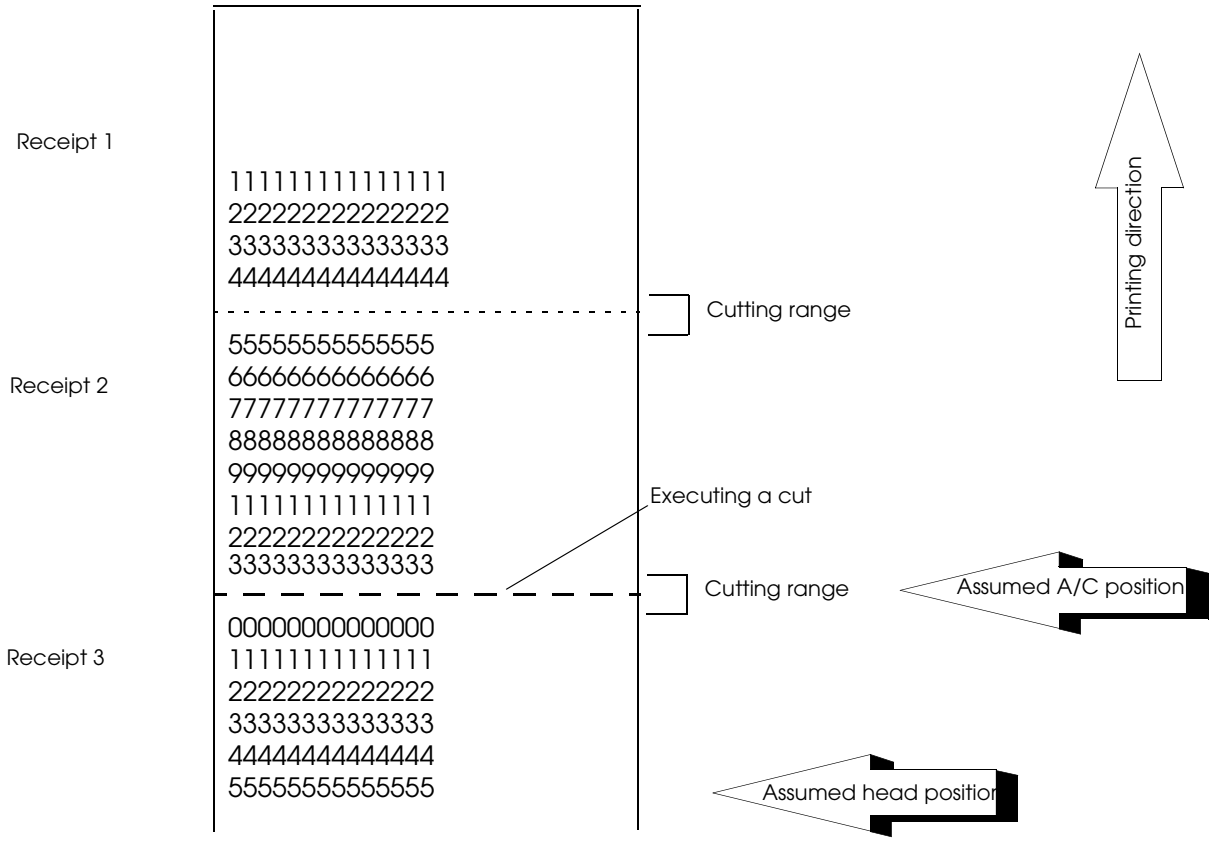
4. When the cutting range of Receipt 1 reaches the autocutter position while printing Receipt 2, the printer cuts the paper.



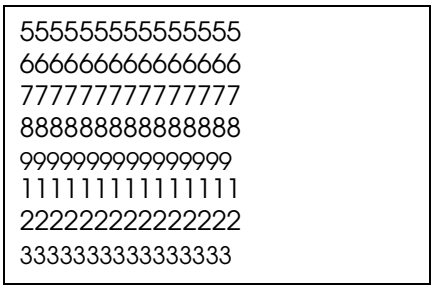
5. When printing the last line of Receipt 2, the application executes **GS V function C**.



6. The application starts printing Receipt 3. When the cutting range of Receipt 2 reaches the autocutter position while printing Receipt 3, the printer cuts the paper.



When you remove the assumed Receipt 2, you will have the result shown below. There will be no space at top and bottom of the paper, which saves paper.



Notes on Using GS V Function C

When using **GS V function C**, there is a possibility of paper not being ejected (or not being cut), depending on usage.

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Here is an example when executing the following steps.

1. Print receipt A
2. Execute **GS V 98 0**
3. Print receipt B
4. Execute **GS V 98 0**
5. Print receipt C
6. Execute **GS V 98 0**

If the cutting ranges designated in step 4 and 5 have not reached the autocutter position, Receipt B and C will not be cut. Even if they have reached the autocutter position and have been cut, the receipts do not reach the paper exit. With this condition, if the next printing is not performed, Receipts B and C will not be ejected. Therefore, be sure to take the following into consideration. Executing paper feed after a certain time has passed or executing a cut with **GS V 66 0** for each receipt.

Appendix A
Specifications

Printing Specifications

Item	Specification
Printing method	Serial impact dot-matrix
Head wire configuration	9-pin serial configuration
Printing direction	Bi-directional printing (logical seeking)
Printing speed	Approx. 3.5 lps (40 column, 16 cpi)
	Approx. 6.4 lps (16 column, 16 cpi) (excludes data transfer and processing time)
Character per line	See table A-1
Character per inch	See table A-1
Two-color printing	Black and read colors selectable

Character Specifications

Item	Specification
Character types	Alphanumerics (95 characters) Graphics (128 × 8 character tables) International characters (37 characters)
Character configuration	7 × 9, 9 × 9
Character size	See table A-1

Table A-1 Character per line, character per inch, character size

Character configuration W × H	Character configuration Character types	Character dimensions W × H(mm)	Dot spacing between characters	Characters per line	Characters per 25.4 mm
7 × 9 (default)	ANK	1.2 × 3.1	3 Half-dot	40	16
	Graphics	1.7 × 3.1	0	40	16
9 × 9	ANK	1.6 × 3.1	3 Half-dot	33	13.3
	Graphics	2.0 × 3.1	0	33	13.3
7 × 9	ANK	1.2 × 3.1	2 Half-dot	42	17.8
	Graphics	1.6 × 3.1	0	42	17.8
9 × 9	ANK	1.6 × 3.1	2 Half-dot	35	14.5
	Graphics	1.9 × 3.1	0	35	14.5

(cpi: characters per 25.4 mm (characters per inch))

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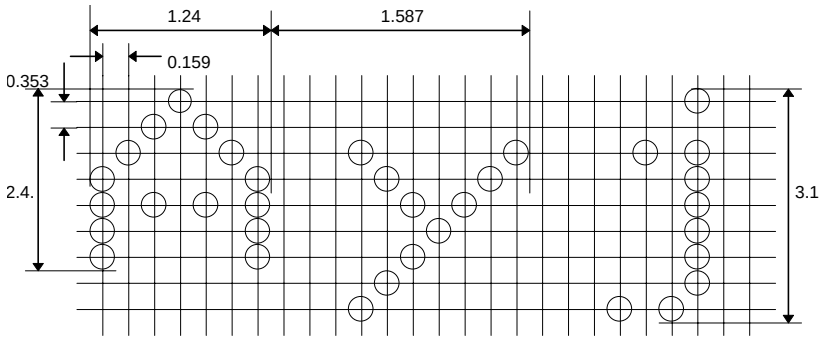
(cpl: characters per line)

(lps: lines per second)

Note:
The dot spacing between characters for 3-half dot and 2 half-dot can be set by changing the DIP switch setting.



(Units: mm)

Figure A-1 7 × 9 font

Paper Specifications

Item	Specification	
Paper feed method	Friction feed	
Paper feed interval	Initial setting: approximately 0.176 mm {1/6"} Can be set in units of approximately 0.176 mm {1/144"} by a command	
Paper feed speed	Approximately 4.17 inches/second (25 lps) (continuous printing) (lps: lines per second)	
Paper dimensions	Paper roll	Width: 76 ± 0.5 {3" ± 0.02"}
		Maximum diameter: 83 mm
		Core: when there is no near end sensor, always be sure to use a paper roll htat is not glued to the core
		Normal paper: Paper thickness: 1 sheet 0.06 to 0.085 mm Mass: 52.3 to 64 g/m^2 {14 to 17lb} (45 to 55 kg/1000 sheets/ 1091×788 mm}

Autocutter Specifications

Partial cut is executed by command.
Partial cut: cutting with one point left uncut

Printing Area

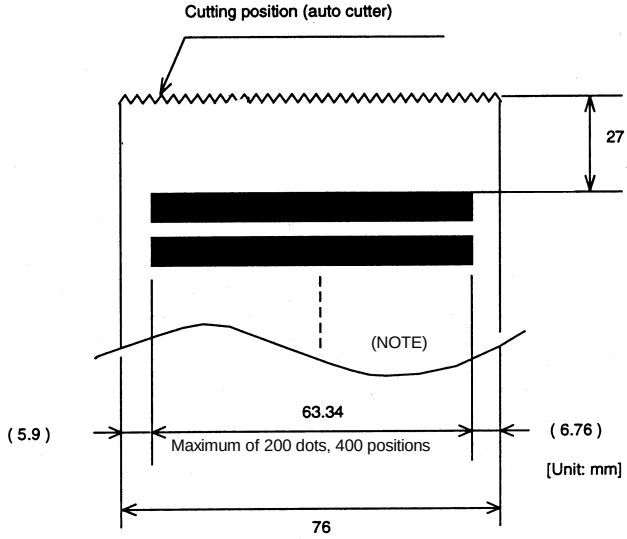


Figure A-2 Printing area

Note:
The values shown for the printing area are the values calculated (between dot centers) according to the wire diameter (0.29 mm {0.0011"}).

Electrical Specifications

- ❑ Power supply operations: AC adapter PS-180
- ❑ Printer power consumption: operating: 38 W avg., standby: 3W avg.

Environmental Specifications

- ❑ Temperature
  - During operation:
    0 to 50°C {41° to 122°F} (At 34°C {93°F} or higher, there are humidity restrictions
  - During storage: -10 to 50°C {14° to 122°F} (excludes paper and ribbon)

❑ Humidity

- During operation: 10 to 90% (no condensation)
  During storage: 10 to 90% (no condensation; excludes paper and ribbon)

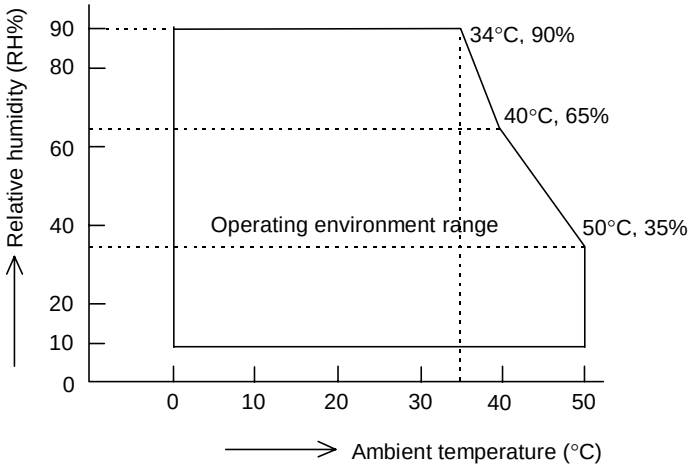


Figure A-3 Ambient temperature (°C)

External Appearance

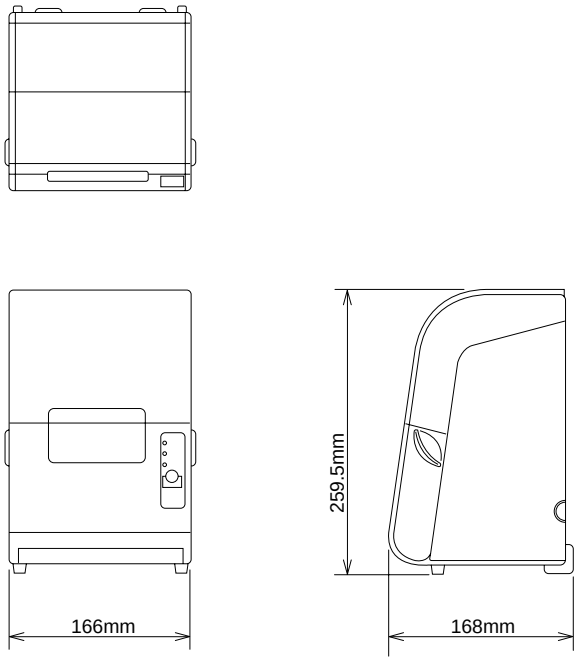


Figure A-4 Without the power supply cover

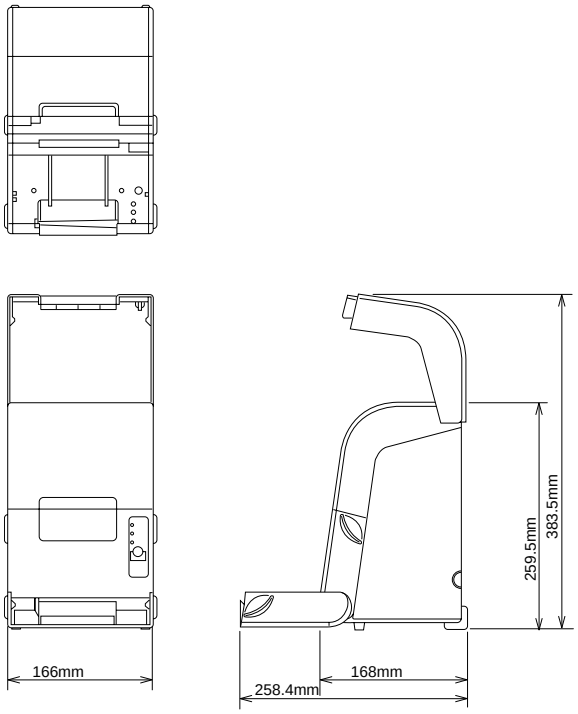


Figure A-5 When the cover is opened

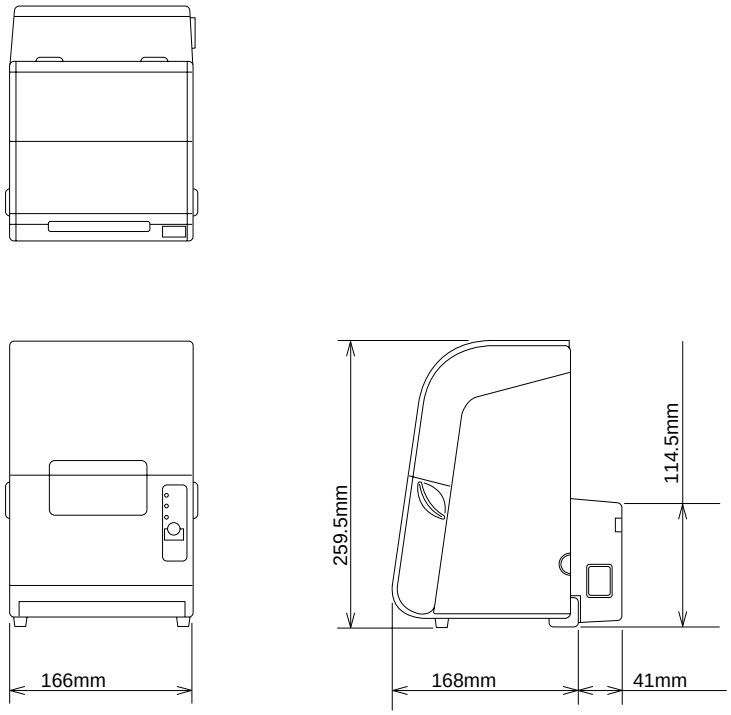


Figure A-6 When placed on the desk with the power supply box

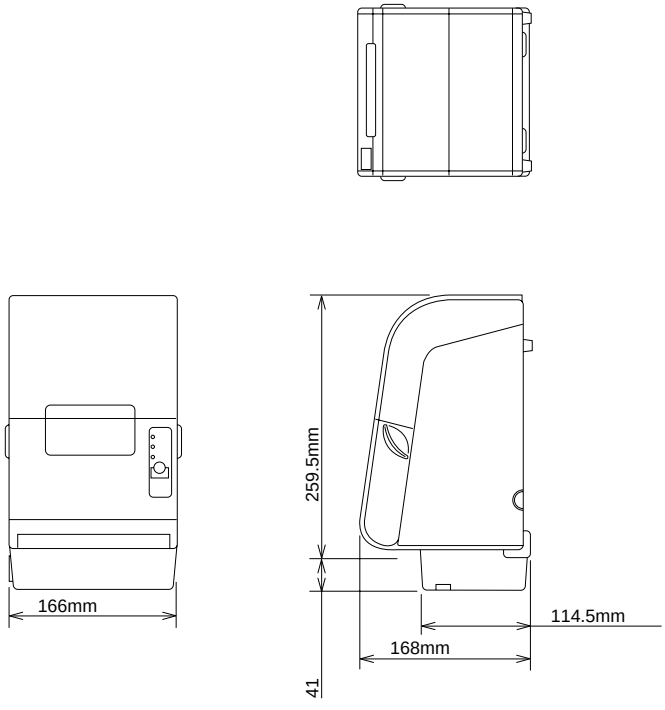


Figure A-7 When hanging on the wall with the power supply box

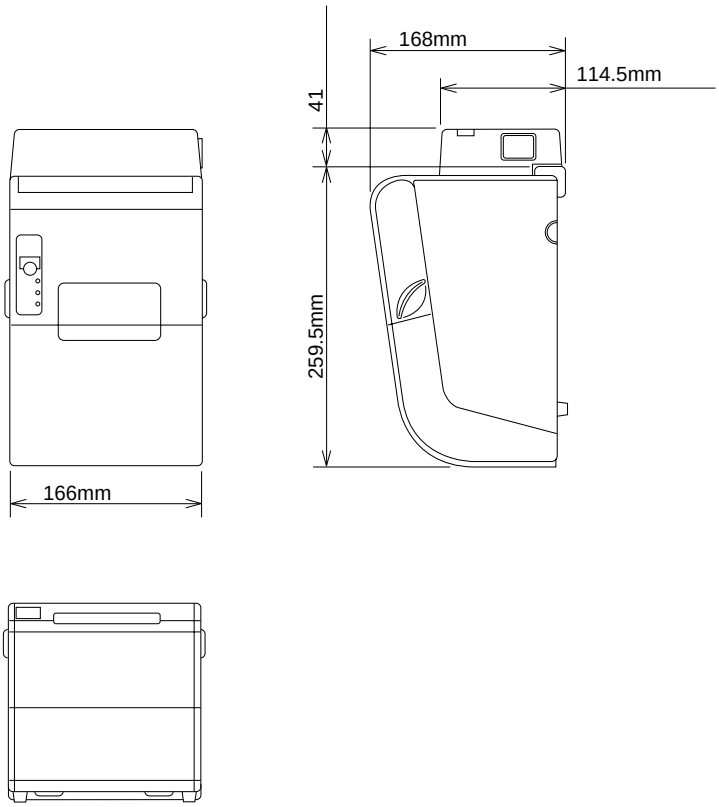


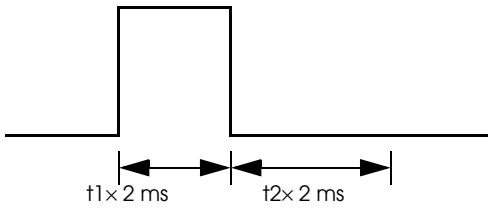
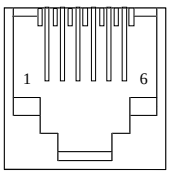
Figure A-8 When placed horizontally with the power supply box

Drawer Kick-out Connector

The signal specified by the **ESC p** command is output to this connector. The host can check the status of input signal by the following commands.

- **DLE EOT**
- **GS r**
- **GS a (ASB)**

Drawer Kick-out Specifications

Item		Specifications
Pin assignment		See "Drawer kick-out connector pin assignment" table
Model	Printer side	Molex 52018-6615 (or equivalent)
	User side	6-position 6-contact (RJ12 telephone jack)
Drawer kick drive signal	Output voltage	Approx. 24 V
	Output current	1A or less
	Output waveform	 Outputs the waveforms in the figure "Drawer circuitry". (The **ESC p** command specifies ON time ***t1*** and OFF time ***t2***.)
Drawer open/close signal	Input signal level (connector pin)	"L"= 0 V "H"= 2Å`5 V
Connector appearance		

Limitations

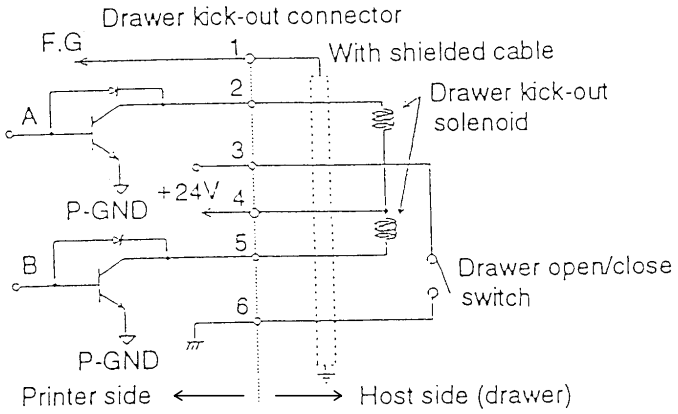
- ❑ The resistance of the drawer kick-out solenoid must not be less than that specified (24 Ω). Otherwisee, an overcurrent could damage the solenoid.
- ❑ Drawer kick-out cable must be shielded.

- ❑ Two driver transistors cannot be driven simultaneously.
- ❑ Do not drive the drawer continuously.
- ❑ Be sure to use the printer power supply (conector pin 4) for the drawer power source.
- ❑ Do not connect a telephone line to the drawer kick-out connector.

Pin Assignment

Pin No.	Signal name	Direction
1	Frame GND	--
2	Drawer kick drive signal 1	Output
3	Drawer kick open/close signal	Input
4	+ 24V	--
5	Drawer kick drive signal 2	Output
6	Signal GND	--

Drawer Circuitry



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Appendix B: The table below shows the status when the parameter ***t2*** of **GS z 0** is 0 (default). When ***t2*** = 0, **DLE ENQ 0** can be used to return to the online status. (The PAPER OUT LED will be off.)

When ***t2*** ≠ 0, the printer recovers from the offline status automatically after a defined time is passed and the PAPER OUT LED will be off automatically.

When selecting the paper near end sensor enabled to stop printing with **ESC c 4**

Status	Paper Roll Status	LED Status			Communication status	Comments
		POWER	ERROR	PAPER OUT		
Status (A)	Normal operation (with sufficient paper)	On	Off	Off	Online	
Status (B)	Paper near end sensor	On	On	On (blinking) *1	Offline	*1 Refer to the DIP switch setting section on page 1-4 for the PAPER OUT LED and the internal buzzer.
Status (C)	Pressing the FEED button in status (B)	On	On	Off	Offline	Pressing the FEED button can turn off the PAPER OUT LED (and stop the buzzer sound). After pressing the FEED button, only the ERROR LED is on. Be sure to replace the paper roll.
Status (D)	After replacing paper roll	On	On	On (blinking) *1	Offline	*1 Refer to the DIP switch setting section on page 1-4 for the PAPER OUT LED and the internal buzzer.
Status (E)	Pressing FEED button in Status (D)	On	Off	Off	Online	

When selecting the paper near end sensor disabled to stop printing with **ESC c 4**

Status	Paper Roll Status	LED Status			Communication status	Comments
		POWER	ERROR	PAPER OUT		
Status (A)	Normal operation (with sufficient paper)	On	Off	Off	Online	
Status (B)	Paper near-end sensor	On	Off	On (blinking) *1	Online	*1 Refer to the DIP switch setting section on page 1-4 for the PAPER OUT LED and the internal buzzer.
Status (C))	Pressing the FEED button in status (B)	On	Off	Off	Online	Pressing the FEED button can turn off the PAPER OUT LED (and stop the buzzer sound). After pressing the FEED button, only the ERROR LED is on. Be sure to replace the paper roll.
Status (D)	Paper-end sensor	On	On	On (blinking) *1	Offline	*1 Refer to the DIP switch setting section on page 1-4 for the PAPER OUT LED and the internal buzzer.
Status (E)	Pressing the FEED button in status (D)	On	On	Off	Offline	Pressing the FEED button can turn off the PAPER OUT LED (and stop a buzzer sound). After pressing the FEED button, only the ERROR LED is on. Be sure to replace the paper roll.
Status (F)	After replacing paper roll	On	On	On (blinking) *1	Offline	*1 Refer to the DIP switch setting section on page 1-4 for the PAPER OUT LED and the internal buzzer.
Status (G)	Pressing the FEED button in status (F)	On	Off	Off	Online	

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